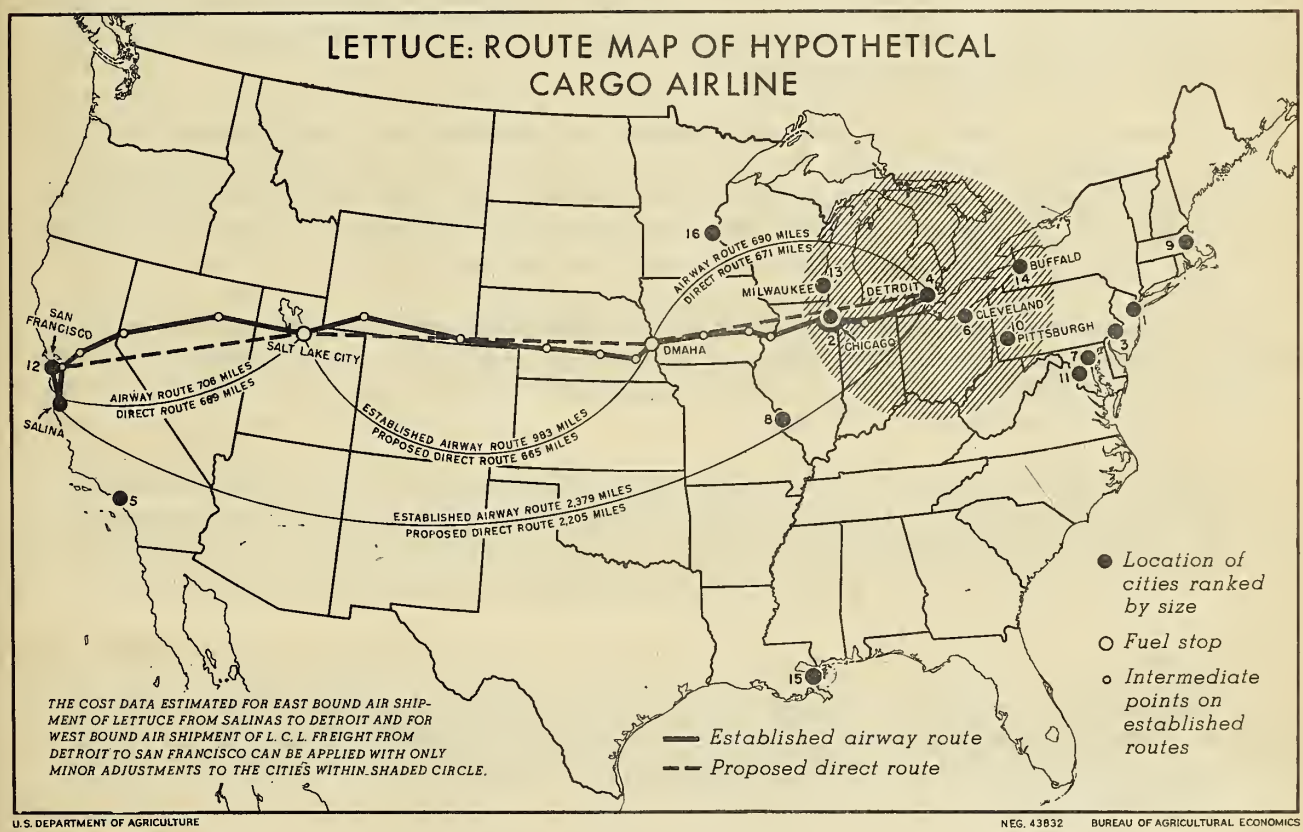
THE Marketing and Transportation SITUATION

BUREAU OF AGRICULTURAL ECONOMICS
UNITED STATES DEPARTMENT OF AGRICULTURE

MTS - 24 BAE AUGUST 1944



Lettuce from the Salinas Valley of California could be flown to the Detroit market in the post-war period at a cost approximately $3\frac{3}{4}$ cents per pound above that of the rail-transported product. The ton-mile cost would be about $6\frac{1}{2}$ cents. Experimental sales indicate that air-borne Iceberg lettuce from California can be marketed in quantity in Detroit at a differential of 5 cents per head over surface-transported lettuce.

MARKETING AND TRANSPORTATION SITUATION

AUGUST 1944

POST-WAR AIR-TRANSPORT COSTS AND MARKETS FOR LETTUCE 1/

Conclusions

1. Lettuce from the Salinas Valley of California could be flown to the Detroit market in the post-war period at a cost approximately 3-3/4 cents per pound above that of the rail-borne product. The ton-mile cost would be 6.55 cents. The speed in transit by air would be about 17 times greater than by rail.

2. These costs are based on the assumption that the same aircraft used to transport lettuce on the West-to-East route would also transport manufactured goods on the East-to-West route, using the San Francisco air gateway as a point for West coast distribution or export. Air carrying-costs for such back-haul traffic are estimated at 9.08 cents per ton-mile.

3. To achieve these favorable ton-mile costs, a hypothetical contract-carrier service is contemplated, to operate on an extremely economical basis, employing a fleet of eight Douglas C-54A cargo planes at a total cost of 58.25 cents per plane-mile, including a 10-percent margin for the operating company. A plane's initial cost does not greatly influence its ton-mile cost of operation.

4. Air-borne Iceberg lettuce from the Salinas-Watsonville area can be marketed in quantity in Detroit at a differential of 5 cents a head over surface-borne lettuce. The number of consumers willing to pay such a differential is sufficient to justify the use of air transport for lettuce.

5. Although lettuce has as low a density per cubic foot as any major perishable agricultural product except flowers, the weight limit of the C-54A plane was reached before the limit of the stowage capacity. In the transportation of perishables the density of the product is of secondary consideration.

Introduction

The purpose of this study is to explore the possibility of transporting relatively low-value perishable agricultural commodities long distances by air at carrying charges consistent with the consuming public's willingness and ability to pay at points of destination.

Head lettuce was selected as the subject of this study because it is a year-round dietary staple in a large and growing number of American homes. The Salinas-Watsonville area of California was chosen as the western terminus of the hypothetical air transport operation because that area is the largest single producer of lettuce in the United States, enjoying a shipping season of approximately 8 months' duration. Shipments from this area combined with those from the Imperial Valley, Salt River, and Yuma Valleys, where the shipping season covers the remaining 4 months, form the basis of a year-round cargo operation.

1/ This is a summary of a report on a project which was undertaken cooperatively by the Bureau of Agricultural Economics and the Edward S. Evans Transportation Research. Detailed acknowledgment of cooperation received from various agencies is made in the complete report published by Rand McNally & Company, which is available on request to the Edward S. Evans Products Company, 15310 Fullerton Avenue, Detroit 27, Michigan.

The Detroit metropolitan market was chosen as the eastern destination of the lettuce because of its central location in one of the country's great concentrations of population and buying power.

The assumptions used in this study are: (1) capacity plane loads of lettuce or other perishables will be available on a scheduled flight basis for the West-to-East trip; (2) three-fourths capacity pay loads of miscellaneous freight will be available for the East-to-West trip; and (3) the service will be performed by a contract carrier airline independently of passenger, mail, and express services now being performed by conventional air-transport lines.

All present lettuce movement from Salinas to Detroit is by rail, the best pre-war time being 8 days. Rail shipment costs, including protective charges, amount to 2.25 cents per ton-mile, or 2.96 cents per net pound.

Potential Cost of Air Shipment

All costs were estimated on the basis of a carrier operating a fleet of eight Douglas C-54A cargo planes between Salinas and Detroit over existing airways. The proposed route is shown on the map on the cover page.

In actual operation, at least in the early stages of the carrier's existence, there might be insufficient westbound tonnage from Detroit to San Francisco to utilize three-fourths of an eight-plane fleet's capacity. As the map shows, the five largest cities within a radius of approximately 300 miles of Detroit are, in order of their population, Chicago, Cleveland, Pittsburgh, Milwaukee, and Buffalo. Additional eastern terminals could be established at one or more of these important cities. The principal reason for considering more than one would be to insure adequate westbound tonnage.

The plane selected for this hypothetical operation is the Douglas four-engine C-54A "Skymaster." A mass of operational experience is being gained with this transport plane during the war, and it is probable that this type of aircraft will become available in considerable numbers after the war.

On the longest single segment of the proposed route - 983 miles from Salt Lake City to Omaha - the C-54A can haul a pay load of 17,100 pounds, or 225 crates of lettuce, gross weight (dry pack). This is equal to 72 percent of a standard refrigerator carload. It is taken now for the purposes of this study as the maximum pay load for the entire trip. The standard wooden lettuce crate, with a tare weight of 10 pounds, is used in the preliminary computations.

At the ranges indicated (706, 983, and 690 miles), the "Skymaster" would be efficient and economical in operation. It would require but minor conversion from its present military form to be suitable for such an operation. Its paratroop benches and certain other military equipment would be removed and replaced with light but adequate tie-down devices to protect the cargo in flight, on take-off, and in landing.

Stowage of the above amount of pay load works out well. Crated lettuce has sufficient density to permit use of considerably less than the total available cargo space for the weight of cargo carried. A feasible stowage would be four longitudinal rows, two on each side of the plane, allowing a 22-inch central passageway, the outer two rows 4 crates high and the inner two rows 5 crates high.

Total flying time for the Salinas-Detroit eastbound trip would be about 12 hours and 51 minutes; for the westbound Detroit-San Francisco trip, about 13 hours and 43 minutes. Another 40 minutes flight would cover the San Francisco-Salinas leg. Thus, total round-trip flying time would be 27 hours and 14 minutes. To this figure must be added two 45-minute fueling stops on each one-way trip, plus loading, unloading, and lay-over time at Salinas, Detroit, and San Francisco. The C-54A would make a block-to-block speed of about 185 miles per hour.

An eight-plane fleet could fly a total of 4,852,800 miles each year and could transport annually the equivalent of 734 rail refrigerator carloads of lettuce between Salinas and Detroit. On the basis of a 75 percent load factor, a yearly total of 6,528 tons of westbound traffic is estimated for the eight-plane fleet.

Total costs per mile flown for an operation such as described herein, including aircraft operation, ground and indirect expenses, and a marginal figure of 10 percent of these expenses, would be 58.25 cents.

To estimate other "aircraft operating expenses" and all "ground and indirect expenses," a tabulation has been made of the 1940 (pre-war) experience of Braniff Airways, a medium-sized, economical, domestic airline, as reported by the Civil Aeronautics Board. In that year Braniff flew a total of 4,945,759 miles compared with the 4,852,800 estimated for the proposed cargo carrier. It is thought that Braniff's experience, though essentially that of passenger and mail airline, may be of value in estimating costs for a cargo carrier service.

The total preliminary air transportation cost of lettuce flown from Salinas to Detroit would be 6.81 cents per ton-mile. This cost works out to 9.33 cents per pound of lettuce. These figures are obtained as follows:

Total operating cost per mile flown (cents)	58.25
Total miles per eastbound flight	2,379
Total operating cost per eastbound flight	$ 1,385.77
Tons of crated lettuce per eastbound flight	8.55
Lettuce ton-miles performed per eastbound flight	20,340
Lettuce ton-mile cost on eastbound flight (cents) ...	6.81
Crates of lettuce per flight	225
Net lettuce per crate (pounds) 2/	66
Net lettuce per flight (pounds)	14,850
Operating cost per eastbound flight	$ 1,385.77
Transportation cost per net pound of lettuce (cents)	9.33

For the shipment of lettuce by air from Salinas to Detroit, as developed in this study, a premium transportation cost of 6.37 cents per pound over the rail cost is estimated. This is calculated by subtracting the rail transportation cost of 2.96 cents per pound from the air transportation cost of 9.33 cents per pound.

2/ A 6-pound difference in the net weight of lettuce per package will be noted in this item as compared with the net weight shown for rail transportation. This difference is accounted for by the fact that air shipment is contemplated without recourse to "package ice," thus permitting the packing of 6 pounds, or 10 percent, more lettuce per crate.

Table 1.- Cost per mile of operation for Braniff Airways, 1940, and estimated cost per mile of projected cargo airline, post-war 1/

Item	Cost per mile	
	Braniff 1940	Projected cargo airline (post-war)
	Cents	Cents
Aircraft operating expenses:		
Flying operations	7.73	2/11.11
Gasoline and oil	7.15	3/17.21
Flight equipment depreciation	4.04	4/ 3.87
Direct flight equipment maintenance	7.44	7.44
Insurance	2.95	2.95
Other	.73	---
Total aircraft operating	30.04	42.58
Ground and indirect expenses:		
Ground operations	8.29	5.65
Direct ground equipment maintenance	.71	.20
Indirect equipment maintenance	2.43	2.43
Ground equipment depreciation	.47	.09
Passenger service	2.22	---
Traffic, sales, advertising, general and administrative	8.29	2.00
Total ground	22.41	10.37
Grand total	52.45	52.95
Add 10 percent margin	---	5.30
Total costs per mile	52.45	58.25

1/ Annual Airline Statistics, Civil Aeronautics Board, Economics Bureau, Rates and Audits Division.

2/ Calculated on the basis of pre-war pay rates of Transcontinental & Western Air, Inc., for flight crews on four-engine "Stratoliners," each crew on cargo airliner to include pilot, co-pilot, and flight engineer; a total of 30 crews to be employed.

3/ Based on gas consumption of 1 gallon per mile, an estimated post-war gasoline cost of 15 cents per gallon, and oil cost of 56 cents per gallon.

4/ Based on purchase, at 25 percent of original cost, of 8 surplus aircraft at $100,000 each, 16 spare engines at $3,000 each, and 20 percent spare parts (The 25 percent is merely an assumption for working purposes, and carries no implications regarding fair evaluations of surplus war equipment.) Depreciation periods are figured on aircraft at 5 years and on engines at 3,500 hours flying. A 10 percent salvage value is assumed. An item of $5,000 per plane has been included to cover conversion costs, such as the removal of military equipment for weight saving and the purchase and installation of tie-down devices.

Some Possible Cost Savings in the Post-War Period and Final Air Premium Cost for Lettuce

The foregoing air transportation costs are based on using the type of shipping container now in use and on flying planes which have already been developed over airways which have already been laid out.

Definite opportunities will exist in the post-war period, however, to lower air transportation costs by the use of: (1) lighter and more efficient shipping containers, (2) new non-stop airways between distant cities, (3) planes designed specifically for the hauling of commercial cargo, (4) elimination of packing-shed costs, and (5) decreased amount of waste.

Savings by the use of fiberboard containers: 3/ In this study the lettuce container assumed is the standard wooden Los Angeles crate. This wooden package has been found necessary in rail transport for the protection of the commodity in transit. Since the speed of air transport will permit "dry-pack" shipments and eliminate ice refrigeration, and since the air-borne product may be expected to receive gentler handling in transit, the use of a lighter, more efficient fiberboard container would appear to be an advantage.

Investigation discloses that 66 pounds of "dry-pack" lettuce (the same amount of dry-pack as carried in a wooden crate weighing 10 pounds) could be packed in a fiber container smaller than the wooden crate and weighing only 3-3/4 pounds. Use of a fiberboard box would reduce the gross weight of each packaged unit from 76 to 69-3/4 pounds. This saving would permit the loading of 20 additional crates per plane, with no increase in total pay load over the 17,100 pounds.

The cost of transporting a pound of lettuce thus would be reduced from 9.33 to 8.57 cents, and the premium in cost per pound over rail shipment would be reduced to approximately 5.61 cents.

Savings by new non-stop airways: The route between Salinas and Detroit, as outlined in heavy lines on the map, totals 2,379 miles. This route follows existing airways at every point, passing over each intermediate city on the now established airline routes. It would be permissible, however, for a contract carrier airline such as described herein to fly the shortest ("great circle") route between Salt Lake City and Omaha, without regard to intermediate points, and thus reduce the mileage of this segment to 865 miles. The accompanying map shows the comparison between the established airway route and the suggested direct route. Applying the savings possible on the other two legs of the Salinas-Detroit flight, total mileage could be cut to 2,205, a reduction of 7.3 percent from the 2,379-mile distance.

Such savings on the three hops, and the correspondingly lighter gasoline load on the pay load-limiting Salt Lake City-Omaha segment would permit 700 pounds of additional pay load 4/. On the basis of using the fiberboard containers suggested, this would result in 10 additional containers of lettuce, or a grand total of 255 lightweight containers, and a pay load of 17,800 pounds. On this basis, the cost of transporting lettuce per pound is further reduced to 8.23 cents, the differential over rail-borne lettuce then being only 5.27 cents per pound.

3/ Data for this section have been furnished by Mr. Claude N. Palmer, Director of Research, United Fresh Fruit and Vegetable Association.

4/ This additional pay load would be within the plane's load capacity if landing gear were "beefed up" somewhat. Such landing gear revisions are contemplated by the manufacturer.

Savings by specially-designed cargo planes: Although no actual estimate will be made here of potential savings which might be effected, it should be obvious that lower air transport costs for cargo could be achieved in the post-war period by the use of aircraft specifically designed - from the drawing-board up - to haul commercial cargo.

Packing costs: Practically all Iceberg lettuce shipped by rail from California to eastern markets is ice-packed. The lettuce is harvested and loaded into large specially-built trailers and hauled to centrally located packing sheds. Here the lettuce is trimmed and packed in the 10-pound wooden Los Angeles lettuce crate. Alternate layers of lettuce and snow ice are packed into the crate until three layers of lettuce and three of ice are packed. About 60 pounds of lettuce and 10 to 30 pounds of ice are packed, and the crate is then closed. After the crates are stacked in a refrigerator car 10,000 to 25,000 pounds of snow ice are blown into the car, filling the spaces between the crates and the space between the roof of the car and the crates.

Lettuce for air transportation would be packed without ice. As contrasted with the ice-packed lettuce, probably more wrapper leaves would be left on the heads. Lettuce for air shipment could be cut and packed directly in wooden or paper containers in the field and hauled by trucks to the airport for loading on the plane. The net difference in cost of handling the lettuce by these two methods has been estimated by several packing-shed operators as about 60 cents per crate in favor of the lettuce packed for air shipment. The difference in cost does not include the additional cost of hauling the lettuce to the plane, nor does it include possible container savings and savings in top or bunker ice. It does include savings in packing-shed labor, machinery, overhead, and crate ice.

Handling lettuce for air shipment as indicated will increase the quantity of lettuce harvested per acre of lettuce by about 10 percent. Increased yield will result from not "balling" the lettuce as much as is done in ice packing, permitting use of many of the small heads which otherwise would be wasted and the use of many heads, that would be 6-dozen size if ice packed, as 5-dozen size packed for air shipment. With lettuce costing the packer $2 per crate, a saving of 20 cents per crate results.

The costs of shipping lettuce have been calculated from airport to airport. The additional cost of hauling the lettuce to the airport would be about 10 cents per crate and from the Detroit airport to the terminal market about 10 cents per crate. The net difference between expected savings and additional costs would be 60 cents per 60-pound standard crate or 1 cent per pound. On this basis the net differential between rail-borne and air-borne lettuce would be reduced to 4.27 cents per pound.

Waste: As lettuce is usually handled the waste in distribution is about as high as for any of the major fruits and vegetables. The best information available indicates that, of the total waste, about 6 percent spoils after it reaches the retail counter, an additional 4 percent is lost by reduction in price to avoid complete loss, and 2 percent spoils in the wholesale channels; a total loss of 12 percent of the first expected retail value.

Information obtained from the test flights of the lettuce and from other sources indicates the waste probably could be brought down to not more than 6 percent. Sharply shortened time in transit and packing the lettuce without ice are the principal factors contributing to less wastage. Lettuce packed with ice is subject to considerably more bruising than when dry packed. The long time in

transit and the bruised and extremely wet condition of the lettuce when packed with the necessary ice for surface transportation are conducive to discoloration and decay. Because of the short time between the harvesting and the retailing of air-transported lettuce, the condition of the heads before starting to move is not so vital as for rail shipment.

If these estimates prove to be justified, the net difference between the cost of transportation by rail and by air would be reduced by an additional ½ cent per pound. If all estimated savings are realized, the net differential between costs by air and by rail transportation would be only about 3-3/4 cents per pound of lettuce.

Test Flights of Lettuce

The quantity of lettuce shipped by air freight will depend upon consumer acceptance of the lettuce. This in turn is governed by consumer-purchasing power, the general quality and prevailing price levels of lettuce, and the relative prices and qualities of lettuce shipped by air and by surface carrier.

To obtain an indication of whether the quality of air-borne lettuce is sufficiently high to sell a substantial quantity at a 5-cent differential per head between the air- and surface-transported lettuce, over 1,000 pounds were shipped from the Salinas-Watsonville area of California to Detroit, Michigan. The 5-cent differential was chosen in order to allow for a margin of error in the cost calculations. As nearly as possible, the same quality of lettuce was shipped by air as was moving by rail at the time, so that the lettuce sold in competition in Detroit was of comparable quality when it left the field.

As the lettuce in the trial shipments had to move on regular passenger-flight schedules, the handling was not typical of what is expected when cargoes of lettuce begin to move by air in commercial quantities. The lettuce on the experimental flight was hauled in the rear cargo compartment of a DC-3 passenger plane and in this compartment was subjected to temperatures of 60° to 80° Fahrenheit instead of 40° to 50° as would be experienced in a regular cargo flight. Time from harvesting to retail store was about 48 hours on the trial shipments instead of 24 hours as it probably would be on regular cargo flights.

Physical Condition of the Lettuce

On arrival in Detroit the lettuce was inspected by Kroger produce men and a representative from the Department of Agriculture. The general opinion was that the lettuce on arrival was in nearly as good condition as when it left California. The principal difference between the air-transported lettuce and the surface-transported lettuce was in appearance. As contrasted with the rail-borne lettuce, the flown lettuce was more green and the heads appeared larger because more of the wrapper leaves had been left on the heads. The air-borne lettuce was a light green color through the entire head whereas in the rail-borne lettuce the original green color in the center of the head had acquired a slightly yellow cast. Atmospheric changes while in flight apparently did not affect the product.

Retail Store Sales

The sale of the air-borne lettuce in retail stores had three objectives. The first was to learn the rate of sale of the air-borne lettuce compared with that of surface-transported lettuce when it was sold unadvertised and at 5 cents per head higher than the latter. The second objective was to learn the effect on these results when the lettuce was advertised as air-borne. The third objective was to learn the relative quantity that would be sold if the price differential was decreased from 5 cents per head to 4 and to 3 cents.

On arrival at the Detroit airport the lettuce was taken immediately to the retail stores. Three Kroger stores situated in the same general locality were selected. The incomes of the residents of this section are slightly above the average incomes of all the families served by the Detroit Kroger stores. All three of the stores were self-service.

In each store a crate of 5-dozen heads of average quality air-borne lettuce was offered in competition with a crate of 5-dozen heads of average quality surface-borne lettuce. Both types were displayed on produce racks, arranged so that an equal quantity of each type was displayed, separated by only one other vegetable. The displays were maintained at about the same size until either was depleted to such an extent that they were no longer comparable. When all except 6 heads were sold from either rack, the remaining heads of the other type were counted. If all of the lettuce had not been sold by the end of the day, a count was made of the remaining heads on each rack. On June 16, 23, and 30 the surface-transported lettuce sold for 11 cents per head. On July 7 it sold for 10 cents per head. The results of the store sales are shown in table 2.

Table 2.- Heads of rail-borne and air-borne lettuce sold in competition in four Detroit retail stores, 1944

Date	Store A: Lettuce unidenitified			Store B: Lettuce unidentified			Store C: Lettuce identified			Store D 1/: Lettuce identified		
	Differential per head	Rail	Air	Differential per head	Rail	Air	Differential per head	Rail	Air	Differential per head	Rail	Air
	Ct.	No.	No.	Ct.	No.	No.	Ct.	No.	No.	Ct.	No.	No.
June 16	5	2/	2/	4	3/61	52	---	---	---	5	4/	4/
June 23	5	38	51	4	5/16	54	---	---	---	5	50	40
June 30	5	6/	6/	3	25	24	5	18	19	---	---	---
July 7	5	41	43	5	53	54	5	37	25	---	---	---
	Heads of air-borne lettuce sold for every 10 heads of rail-borne lettuce											
June 16	5	---	---	4	10.0	8.5	---	---	---	5	---	---
June 23	5	10.0	13.4	4	10.0	33.7	---	---	---	5	10.0	8.0
June 30	5	---	---	3	10.0	9.6	5	10.0	10.6	---	---	---
July 7	5	10.0	10.5	5	10.0	10.2	5	10.0	6.8	---	---	---

1/ Experiment transferred to store C on June 30 where it could be conducted more conveniently. Store D was a large supermarket while store C was a smaller neighborhood type of store.
2/ 2 crates of rail-borne lettuce were displayed while only 1 crate of air-borne lettuce was displayed.
3/ 10 heads of rail-borne lettuce were added to the display.
4/ Lettuce from 7 crates of rail-borne lettuce was displayed while only 1 crate of air-borne was displayed.
5/ The quality of the rail-borne lettuce was below average.
6/ Air-borne lettuce arrived at 1:00 p.m. after all rail-borne lettuce had been sold.

With the exception of the sales of lettuce in store B on June 23, the ratio of the sale of air-borne lettuce to surface-borne lettuce was about 10 to 10. On the three trials in which the air-borne lettuce was sold unidentified with a 5-cent differential per head, 11.3 heads were sold compared with 10.0 heads of rail-borne lettuce. On the three trials in which the air-borne lettuce was identified, 8.4 heads were sold compared with 10 heads of rail-borne lettuce. The air-borne lettuce was identified by a 10-inch square plagard reading: "Lettuce Transported by Airplane -- Harvested in California Yesterday." The placard was placed about 6 inches above the lettuce. A similar placard for the rail-borne lettuce stated "Lettuce transported by Rail." The quantity of lettuce used in these trials was inadequate to permit any conclusions to be drawn regarding the advisability of advertising that the lettuce was air-borne. It may be that more consumers will pay a differential they believe to be based on "original" quantity than one called to their attention as a matter of transportation costs. The change in the price differential apparently made little difference in the relative sales, but here again the sample was too small to make possible any definite conclusions. Variation in the results would be expected because of the differences in stores and the relative quality of the lettuce from week to week.

Potential Traffic

Data for the year 1943 give a fair indication of the quantity and source of supply of the lettuce shipped by rail to cities in the vicinity of Detroit. A total of 10,001 carloads of lettuce originated in either California or Arizona and were unloaded in Chicago, Detroit, Pittsburgh, Cleveland, Buffalo, and Milwaukee. Approximately 52.1 percent of the lettuce was grown in the Salinas-Watsonville area during the period April through November and 42.6 percent was grown in the Imperial Valley and Arizona areas during December through March.

Shipments of lettuce from California and Arizona fluctuate less during the year than do the shipments of any other major fruit or vegetable. Substantial quantities are marketed during all months of the year. This is an important consideration for any potential air-freight operation. A year-round pay load would be more or less assured.

Results of the experimental sales in the three stores in Detroit indicate that about equal volumes of air-borne lettuce and surface-borne lettuce were sold. If these results are directly applied to the quantity of lettuce shipped by rail to the six cities, a total of about 900 carloads or 1,001 C-54A plane loads from Arizona and California would be expected to sell in Detroit, and about 5,000 carloads or 5,561 C-54A plane loads in Chicago, Detroit, Pittsburgh, Cleveland, Buffalo, and Milwaukee. However, this direct application of the results may be misleading for the following reasons:

(1) No attempt was made to select the Kroger stores used in this experiment in such a way as to sample a cross section of the population of Detroit. Kroger officals stated that stores were situated in a neighborhood of slightly above-average income.

(2) The experiment lasted only 1 month. Results for a year might be significantly different.

(3) Wartime restrictions did not allow a very large sample of air-borne lettuce to be transported for sale in the retail stores. The sample was not adequate for unqualified conclusions.

(4) The test was conducted during a period when consumers' purchasing power was relatively high. Consumers are more willing to pay relatively high prices for good-quality merchandise when their purchasing power is high than when it is low.

Considerations that would tend to offset these limitations are:

(1) The air-borne lettuce was sold for the most part at a 5-cent differential. This differential could be reduced to 3 or 4 cents if all anticipated savings in handling are realized.

(2) Transit conditions were not so satisfactory for the trial shipments of lettuce as they would be when the lettuce moves in commercial quantities in C-54A planes. The inside-plane temperatures were 60 to 80° which under actual operating conditions need not be over 40 to 50°. Elapsed time between harvest and delivery to the retail stores was about 48 hours. In cargo operations, this probably would be only about 24 hours.

(3) The experiment measured only the extent to which air-borne lettuce may replace rail-borne lettuce. It did not take into consideration the additional quantity of lettuce which might be sold. This could be considerable, since no doubt many housewives would buy more lettuce if they could buy better quality throughout the year. Instead of Detroit's consuming approximately 2,000 carloads of lettuce as at the present time, the quantity might be increased to 2,500 or 3,000 carloads each year.

The qualifications which have been presented enable the reader of this report to get a complete, unbiased picture of the results of the investigation. Although they must be given consideration, they do not essentially vitiate the principal conclusions, namely, that air-transported lettuce can be sold in considerable quantities at price differentials sufficient to cover the extra costs of air transport.

FARM-RETAIL PRICE SPREADS, JULY 1944

Food Marketing Charges in July Highest since June 1943

Charges for marketing a food basket containing quantities of farm products equivalent to annual purchases by a typical workingman's family increased from $209 in June to $215 in July, 1944. This is the fourth consecutive increase, and in July these marketing charges averaged 10.8 percent higher than in March, 1944 and were the highest since June, 1943.

Retail Food Prices Continued to Rise - Decline at Farm Halted

Retail cost of the farm food basket continued to increase and the cost of $446 in July was about 1.6 percent higher than in June, almost 3 percent higher than

in March, and the highest since July, 1943. Payments to farmers for equivalent produce amounted to $247 in July, the same as in June, but were about 3.1 percent less than in March and, except for June, were the lowest since February, 1943.

Farmer's Share of Consumer's Food Dollar Reduced Further

The farmer's share of the consumer's dollar spent for farm food products decreased from 56 cents in June to 55 cents in July, 1944. This is the fourth consecutive decrease and the farmer's share in July was 4 cents less than in March and was the least since June, 1943, but was 17 cents more than the average for the 5-year 1935-39 pre-war average. If the cost of marketing payments paid by the Government is added to the retail cost paid by consumers, the farmer's share of the total food cost is reduced from 55 to 53 percent for July 1944.

Retail Food Prices and Expenditures for Food Continue Low in Relation to Total Income

The proportions of total income required for actual food expenditures, and for the purchase of fixed quantities of food representing average annual consumption per person in 1935-39, were somewhat lower in May than the average for 1943 and considerably below those for the 5-year 1935-39 pre-war average. The proportion of total expenditures for all goods and services accounted for by expenditures for foods has remained fairly constant since 1941.

Sharp Retail Price Increases for Eggs and Apples

Contributing most of the substantial increase in the retail cost of the 58 foods from June to July were advances in retail prices amounting to 15 percent for eggs--from 45.7 to 52.7 cents per dozen, and 12 percent for apples--from 12.1 to 13.6 cents per pound. The advances in the retail prices of eggs were accompanied by a somewhat smaller rise, amounting to 11 percent, in prices received by farmers, resulting in a sharp increase of 22 percent in the marketing margin--from 17.6 cents in June to 21.5 cents in July. Prices received by farmers for apples declined by 15 percent from June to July and the marketing margin jumped 45 percent, from 5.6 to 8.1 cents per pound.

Government Marketing Payments Lower in July

Owing chiefly to lower rates of payment to wheat millers, the total Government marketing payments on quantities of produce included in the family basket of 58 foods declined from $17 in June to $16 in July. This decline offset slightly the effect of the higher marketing margin upon the increase in total marketing charges for food products. Total marketing charges in July, including Government payments to marketing agencies, amounted to 48 percent of the retail cost of farm food products to consumers. This percentage was the same as in June, the highest recorded since July 1942.

Table 3.- Annual family purchases of 58 foods 1/

Year and month	Cost at retail	Paid to farmers	Marketing margin	Government marketing payments	Total marketing charges 2/	Farmer's share 3/	Marketing charges as percent of retail cost 3/
	Dollars	Dollars	Dollars	Dollars	Dollars	Percent	Percent
1913-15 average	256	135	121	0	121	53	47
1920	514	272	242	0	242	53	47
1929	415	195	220	0	220	47	53
1935-39 average	332	141	191	4/-2	189	42	57
1941	342	164	178	0	178	48	52
1942	398	209	189	0	189	53	47
1943	447	255	192	8	200	57	45
1943 - July	451	255	196	12	208	57	46
Aug.	440	255	185	12	197	58	45
Sept.	438	255	183	12	195	58	45
Oct.	440	256	184	13	197	58	45
Nov.	440	256	184	14	198	58	45
Dec.	440	258	182	16	198	59	45
1944 - Jan.	440	256	184	16	200	58	45
Feb.	436	253	183	17	200	58	46
Mar.	433	255	178	17	195	5/59	45
Apr.	433	253	180	17	197	58	45
May	436	250	186	17	203	57	47
June	439	247	192	17	209	56	48
July	446	6/247	199	16	215	55	48

1/ Important food products produced by American farmers combined in quantities representing annual purchases by a typical workingman's family. Retail price average for 56 cities from Bureau of Labor Statistics. 2/ Marketing margin plus Government marketing payments. 3/ The last two percentage columns do not add to 100 when marketing taxes or payments are in effect. 4/ Processing taxes in 1935. 5/ Revised. 6/ Preliminary.

Table 4.- Food cost and expenditures compared with total income per person, United States average 1/

Year and month	Total income	Food expenditures: Total expenditures for consumer goods and services: Actual	Food expenditures: As percentage of: Total income	Food expenditures: As percentage of: Total expenditures for goods and services	Cost to consumer of fixed quantities of foods representing average annual consumption per person, 1935-39: Actual	Cost to consumer of fixed quantities of foods representing average annual consumption per person, 1935-39: As percentage of: Total income	Cost to consumer of fixed quantities of foods representing average annual consumption per person, 1935-39: As percentage of: Total expenditures for goods and services
	Dol.	Dol.	Pct.	Pct.	Dol.	Pct.	Pct.
1935-39 average	520	456	118	23	26	118	23	26
1941	692	560	144	21	26	125	18	22
1942	857	612	199	23	33	149	17	24
1943	1,042	685	219	21	32	170	16	25
	Annual rates by months, seasonally adjusted							
1944 - Feb.	1,129	738	233	21	32	170	15	23
Mar.	1,125	690	230	20	33	170	15	25
Apr.	1,120	706	223	20	32	170	15	24
May	1,123	787	230	20	29	170	15	22

Original table p. 3, April-May 1943 issue.

Table 5.- Price spreads between the farmer and the consumer - food products, July 1944

Retail commodity	Table no. 1/	Retail		Farm equivalent		Actual margin	Farm value as percentage of retail price
		Unit	Price	Quantity	Value		
			Cents		Cents	Cents	Percent
Pork products	11	1 lb. prin. pork products	28.7	1.90 lb. live hog	24.1	4.6	84
Dairy products	12	100 lb. milk equivalent	425.5	100 lb. milk equivalent	2/254.8	2/170.7	60
Hens	13	1 lb.	45.1	1.11 lb.	26.9	18.2	60
Eggs	14	1 doz.	52.7	1 doz.	31.2	21.5	59
White flour	15	1 lb.	6.5	1.41 lb. wheat	3.3	3.2	51
White bread	16	1 lb.	8.7	.97 lb. wheat	2.2	6.5	25
Corn meal	17	1 lb.	6.3	1.5 lb. corn	3.1	3.2	49
Rolled oats	18	1 lb.	9.8	1.78 lb. oats	4.2	5.6	43
Corn flakes	19	8-oz. pkg.	6.6	1.275 lb. corn	2.7	3.9	41
Wheat cereal	20	28-oz. pkg.	23.0	2.065 lb. wheat	4.8	18.2	21
Rice	21	1 lb.	12.8	1.51 lb. rough rice	5.9	6.9	46
Navy beans	22	1 lb.	10.7	1 lb. dry beans	6.1	4.6	57
Oranges	24	1 doz.	50.8	1/17 box	19.8	31.0	39
Potatoes	25	1 lb.	5.3	1 lb.	2.3	3.0	43
Apples	35	1 lb.	13.6	1 lb.	5.5	8.1	40
Lamb products	37	1 lb. prin. lamb cuts	35.7	2.16 lb. live lamb	27.4	8.3	77
Sweetpotatoes	38	1 lb.	13.5	1 lb.	4.2	9.3	31
Rye bread	39	1 lb.	9.4	.39 lb. rye and .64 lb. wheat	2.2	7.2	23
Whole wh. bread	40	1 lb.	10.1	.92 lb. wheat	2.1	8.0	21
Macaroni	41	1 lb.	15.7	1.72 lb. durum wheat	4.0	11.7	25
Soda crackers	42	1 lb.	18.9	1.085 lb. wheat	2.5	16.4	13
Peanut butter	44	1 lb.	28.4	1.73 lb. peanuts	13.4	15.0	47
58 foods combined	8	Annual family consumption	$446	Annual family consumption	2/$247	2/$199	55

1/ Table numbers refer to numbering in original 1936 report and annual supplements entitled "Price Spreads Between the Farmer and the Consumer."
2/ Preliminary.
Retail prices from the Bureau of Labor Statistics.

Table 6.- Price spreads between the farmer and the consumer - food products, retail price and farm value, July 1944

Commodity	Retail unit	Retail price				Percentage change to July 1944 from-		Farm equivalent	Farm value				Percentage change to July 1944 from-	
		1935-39 average	July 1943	June 1944	July 1944	July 1943	June 1944		1935-39 average	July 1943	June 1944	July 1944	July 1943	June 1944
		Cents	Cents	Cents	Cents	Percent	Percent		Cents	Cents	Cents	Cents	Percent	Percent
Pork products	1 lb. prin. pork products	25.3	29.5	28.8	28.7	- 3	1/	1.90/lb. live hogs	15.7	25.1	23.9	24.1	- 4	+ 1
Dairy products	100 lb. milk equiv.	324.0	428.4	425.2	425.5	- 1	1/	100 lb. milk equiv.	146.0	248.8	2/252.8	3/254.8	+ 2	+ 1
Hens	1 lb.	31.7	44.5	46.0	45.1	+ 1	- 2	1.11 lb.	16.5	28.1	26.4	26.9	- 4	+ 2
Eggs	1 doz.	36.0	54.2	45.7	52.7	- 3	+ 15	1 doz.	21.7	36.3	28.1	31.2	- 14	+ 11
White flour	1 lb.	4.5	6.1	6.5	6.5	+ 7	0	1.41 lb. wheat	2.0	3.0	3.4	3.3	+ 10	- 3
White bread	1 lb.	8.2	8.8	8.7	8.7	- 1	0	0.97 lb. wheat	1.3	2.0	2.3	2.2	+ 10	- 4
Corn meal	1 lb.	5.0	5.7	6.2	6.3	+ 11	+ 2	1.5 lb. corn	1.8	2.9	3.1	3.1	+ 7	0
Rolled oats	1 lb.	7.4	8.6	9.4	9.8	+ 14	+ 4	1.78 lb. oats	1.9	3.6	4.4	4.2	+ 17	- 5
Corn flakes	8-oz. pkg.	7.8	6.6	6.5	6.6	0	+ 2	1.275 lb. corn	1.6	2.5	2.6	2.7	+ 8	+ 4
Wheat cereal	28-oz. pkg.	24.3	23.3	23.2	23.0	- 1	- 1	2.065 lb. wheat	2.9	4.3	4.9	4.8	+ 12	- 2
Rice	1 lb.	8.2	12.6	12.9	12.8	+ 2	- 1	1.51 lb. rough rice	2.5	5.9	5.9	5.9	0	0
Navy beans	1 lb.	6.9	10.0	10.7	10.7	+ 7	0	1 lb. dry beans	3.5	5.6	6.1	6.1	+ 9	0
Oranges	1 doz.	31.5	47.9	48.2	50.8	+ 6	+ 5	1/17 box	9.3	18.6	17.9	19.8	+ 6	+ 11
Potatoes	1 lb.	2.5	4.8	5.2	5.3	+ 10	+ 2	1 lb.	1.2	2.8	2.1	2.3	- 18	+ 10
Apples	1 lb.	5.5	13.6	12.1	13.6	0	+ 12	1 lb.	1.9	5.3	6.5	5.5	+ 4	- 15
Lamb products	1 lb. prin. lamb cuts	27.2	36.3	35.6	35.7	- 2	1/	2.16 lb. live lamb	16.2	28.7	28.5	27.4	- 5	- 4
Sweetpotatoes	1 lb.	4.4	17.2	12.7	13.5	- 22	+ 6	1 lb.	1.5	4.9	4.2	4.2	- 14	0
Rye bread	1 lb.	9.1	9.5	9.4	9.4	- 1	0	0.39 lb. rye and 0.64 lb. wheat	1.3	2.0	2.3	2.2	+ 10	- 4
Whole wheat bread	1 lb.	9.3	10.1	10.1	10.1	0	0	0.92 lb. wheat	1.3	1.9	2.2	2.1	+ 11	- 5
Macaroni	1 lb.	15.0	15.6	15.7	15.7	+ 1	0	1.72 lb. durum wheat	2.3	3.5	4.0	4.0	+ 14	0
Soda crackers	1 lb.	16.9	18.0	18.9	18.9	+ 5	0	1.085 lb. wheat	1.5	2.3	2.6	2.5	+ 9	- 4
Peanut butter	1 lb.	19.3	33.1	28.4	28.4	- 14	0	1.73 lb. peanuts	6.1	12.4	13.6	13.4	+ 8	- 1
58 foods combined	Annual family consumption	$332	$451	$439	$446	- 1	+ 2	Annual family consumption	$141	$255	$247	$247	- 3	0

1/ Less than 0.5 percent. 2/ Revised. 3/ Preliminary.

Retail prices are 56-city averages as published by the Bureau of Labor Statistics - Farm values are calculated from U. S. average farm price.

Table 7.- Price spreads between the farmer and the consumer - food products, margins, and farm value as percentage of retail price, July 1944

Commodity	Retail unit	Margins 1/				Percentage change to July 1944 from-		Farm value as percentage of retail price			
		1935-39 average	July 1943	June 1944	July 1944	July 1943	June 1944	1935-39 average	July 1943	June 1944	July 1944
		Cents	Cents	Cents	Cents	Percent	Percent	Percent	Percent	Percent	Percent
Pork products	1 lb. prin. pork products	9.6	4.4	4.9	4.6	+ 5	- 6	62	85	83	84
Dairy products	100 lb. milk equiv.	178.0	179.6	2/172.4	3/170.7	- 5	- 1	45	58	59	60
Hens	1 lb.	15.2	16.4	19.6	18.2	+ 11	- 7	52	63	57	60
Eggs	1 doz.	14.3	17.9	17.6	21.5	+ 20	+ 22	60	67	61	59
White flour	1 lb.	2.5	3.1	3.1	3.2	+ 3	+ 3	44	49	52	51
White bread	1 lb.	6.9	6.8	6.4	6.5	- 4	+ 2	16	23	26	25
Corn meal	1 lb.	3.2	2.8	3.1	3.2	+ 14	+ 3	36	51	50	49
Rolled oats	1 lb.	5.5	5.0	5.0	5.6	+ 12	+ 12	26	42	47	43
Corn flakes	8-oz. pkg.	6.2	4.1	3.9	3.9	- 5	0	21	38	40	41
Wheat cereal	28-oz. pkg.	21.4	19.0	18.3	18.2	- 4	- 1	12	18	21	21
Rice	1 lb.	5.7	6.7	7.0	6.9	+ 3	- 1	30	47	46	46
Navy beans	1 lb.	3.4	4.4	4.6	4.6	+ 5	0	51	56	57	57
Oranges	1 lb.	22.2	29.3	30.3	31.0	+ 6	+ 2	30	39	37	39
Potatoes	1 lb.	1.3	2.0	3.1	3.0	+ 50	- 3	48	58	40	43
Apples	1 lb.	3.6	8.3	5.6	8.1	- 2	+ 45	35	39	54	40
Lamb products	1 lb. prin.lamb cuts	11.0	7.6	7.1	8.3	+ 9	+ 17	60	79	80	77
Sweetpotatoes	1 lb.	2.9	12.3	8.5	9.3	- 24	+ 9	34	28	33	31
Rye bread	1 lb.	7.8	7.5	7.1	7.2	- 4	+ 1	14	21	24	23
Whole wheat bread	1 lb.	8.0	8.2	7.9	8.0	- 2	+ 1	14	19	22	21
Macaroni	1 lb.	12.7	12.1	11.7	11.7	- 3	0	15	22	25	25
Soda crackers	1 lb.	15.4	15.7	16.3	16.4	+ 4	+ 1	9	13	14	13
Peanut butter	1 lb.	13.2	20.7	14.8	15.0	- 28	+ 1	32	37	48	47
58 foods combined	Annual family consumption	$191	$196	$192	$199	+ 2	+ 4	42	57	56	55

1/ These margins have not been adjusted to allow for Government marketing payments and taxes. 2/ Revised.
3/ Preliminary.

Table 8.- Farm products: Indexes of prices at several levels of marketing, 1935-39 = 100

Year and month	Cost of living of city families 1/	Foods			Fiber					Prices paid by farmers 3/
		Retail prices of all foods 1/	Wholesale prices 2/	Prices received by farmers for 58 foods 3/	Retail prices of clothing 1/	Wholesale prices of textile products 2/	Prices received by farmers for cotton and wool 4/	Wholesale prices of all farm products 2/	Prices received by farmers for all products 3/	
1913	71	80	81	95	69	81	5/110	94	95	81
1914	72	82	82	97	70	77	97	94	5/ 94	80
1916	78	91	96	110	78	99	131	111	5/110	5/ 99
1918	108	134	151	174	128	193	5/280	195	190	141
1920	143	169	174	193	201	232	5/281	198	5/196	5/161
1929	122	132	126	138	115	127	167	138	5/139	123
1932	98	86	77	62	91	77	55	63	5/ 63	5/ 87
1935	98	100	106	98	97	100	5/108	104	101	100
1936	99	101	104	108	98	101	114	106	5/106	5/ 99
1937	103	105	108	113	103	107	111	114	114	105
1938	101	98	93	92	102	94	81	90	5/ 90	5/ 99
1939	99	95	89	89	100	98	5/ 87	86	88	97
1940	100	97	90	94	102	104	5/ 98	89	5/ 93	5/ 98
1941	105	105	105	116	106	119	131	108	115	105
1942	116	124	126	148	124	136	5/177	139	148	122
1943	124	138	135	181	130	137	190	5/161	5/179	134
1939-Aug.	99	94	85	85	100	5/ 95	5/ 96	80	83	5/ 95
Sept.	101	98	95	95	100	101	5/ 92	90	5/ 91	98
1943-July	124	139	136	181	129	137	5/187	165	5/180	5/135
Aug.	123	137	134	181	129	137	5/189	163	179	5/135
Sept.	124	137	133	181	132	137	5/192	162	5/180	5/135
Oct.	124	138	133	182	133	137	5/192	161	5/181	5/136
Nov.	124	137	134	182	134	138	5/185	160	181	5/137
Dec.	124	137	134	183	135	138	5/189	160	5/182	5/139
1944-Jan.	124	136	133	182	135	138	192	160	5/182	139
Feb.	124	134	132	180	135	138	5/189	161	5/182	140
Mar.	124	134	132	181	137	138	5/189	163	5/182	140
Apr.	5/125	135	133	179	137	138	192	162	5/182	140
May	125	136	133	177	137	138	5/189	162	5/181	140
June	125	136	135	175	138	138	5/192	165	5/180	141
July	126	137	134	175	138	138	194	163	179	141

1/ From "Changes in Cost of Living" Bureau of Labor Statistics.
2/ Calculated from figures of the Bureau of Labor Statistics.
3/ Based on figures published by the United States Department of Agriculture.
4/ Cotton and wool prices weighted by production in the period 1935-39.
5/ Revised.

Table 9.- Indexes of consumer income and of hourly earnings in marketing, 1935-39 = 100

Year and month	Nonagricultural income payments 1/	Monthly earnings per employed factory worker 2/	Hourly earnings in marketing enterprises: Class I steam railways 3/	Food processing 4/	Food marketing 5/	Cotton processing 4/
1929	122	118	93	---	---	---
1935-39 average	100	100	100	100	100	100
1940	115	111	105	110	105	106
1941	138	132	106	116	110	119
1942	170	166	119	128	120	139
1943	207	196	121	139	130	152
1943 - June	207	196	119	140	130	152
July	209	194	119	140	130	152
August	210	197	120	140	131	151
September	211	201	121	140	132	154
October	213	204	121	142	133	153
November	217	205	123	145	134	153
December	219	202	124	146	132	153
1944 - January	222	205	132	146	135	154
February	224	206	137	146	135	154
March	225	207	133	146	135	156
April	224	206	134	148	137	161
May	6/226	209	133	149	138	163
June	7/227	7/210	133	149	138	164

1/ United States Department of Commerce estimates. Adjusted for seasonal variation. Revised series.

2/ Prepared in the Bureau of Agricultural Economics from data of the Bureau of Labor Statistics, adjusted for seasonal variation.

3/ Compiled from data published by the Interstate Commerce Commission.

4/ Bureau of Labor Statistics.

5/ Weighted composite of earnings in steam railways, food processing, wholesaling, and retailing.

6/ Revised.

7/ Preliminary estimates.